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THE CAPACITY FOR GRAMMATICAL DEVELOPMENT IN CHILDREN.

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THE ACQUISITION OF LANGUAGE IS CONSIDERED AS A QUESTION OF SPECIFYING HOW CHILDREN'S CAPACITY FOR LANGUAGE INTERACTS WITH THEIR LINGUISTIC EXPERIENCE--THE INTERACTION TAKING THE FORM OF RELATING THE UNIVERSAL ASPECTS OF THE DEEP STRUCTURE TO THE IDIOSYNCRATIC ASPECTS OF THE SURFACE STRUCTURE OF LANGUAGE. THIS INTERACTION OCCURS IN THE ACQUISITION OF TRANSFORMATIONS. ONE QUESTION ARISING FROM THIS APPROACH IS WHETHER SOME OF THE LINGUISTIC UNIVERSALS SO RELATED EXIST BECAUSE THEY ARE UNIVERSALS OF HUMAN COGNITION. THE AUTHOR FEELS THAT STIMULUS-RESPONSE THEORIES DO NOT ACCOUNT FOR THE ACQUISITION OF DEEP STRUCTURES AND THAT A BIOLOGICAL APPROACH IS MORE APPROPRIATE. THE ORIGIN AND DEVELOPMENT OF CHILDREN'S GRAMMATICAL CLASSES IS DISCUSSED AND THE HYPOTHESIS IS DEVELOPED THAT GRAMMATICAL CLASSES "ARISE FROM AN INITIAL ASSIGNMENT OF SYNTACTIC FEATURES DERIVED FROM THE BASIC GRAMMATICAL RELATIONS." THE ACQUISITION OF TRANSFORMATIONS (ESPECIALLY NEGATION) IS ALSO DISCUSSED AND IT IS CONCLUDED THAT THEY REQUIRE "LITTLE OR NOTHING IN THE WAY OF OVERT PRACTICE." THIS ARTICLE WILL APPEAR AS A CHAPTER IN "GRAMMATICAL DEVELOPMENT IN CHILDREN," D.I. SLOBIN, EDITOR, ACADEMIC PRESS. IT ALSO APPEARED AS ONE OF SEVERAL RESEARCH REPORTS IN "STUDIES IN LANGUAGE AND LANGUAGE BEHAVIOR, PROGRESS REPORT V," SEPTEMBER 1, 1967, CENTER FOR RESEARCH ON LANGUAGE AND LANGUAGE BEHAVIOR, CITY CENTER BUILDING, 220 EAST HURON STREET, ANN ARBOR, MICHIGAN 48108. (AUTHOR/JD)

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# The Capacity for Grammatical Development in Children[1,2]

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The acquisition of language is considered as a question of specifying how children's capacity for language interacts with their linguistic experience.

The basic assumption of this chapter is that the acquisition of a native language can be understood only as an interaction between linguistic experience and a child's innate linguistic capacities. The goal of a theory of language acquisition is set accordingly--it is to provide a description of these capacities and the way they interact with experience, with the ultimate aim being to show how knowledge of language develops automatically, naturally, effortlessly, and, as Slobin emphasizes, quickly. Needless to say, anything like the full attainment of this goal lies in the remote future, if even there, but a beginning can at least be made. The major part of the chapter is an effort in this direction.

First, however, the problem of language acquisition must itself be clarified. It is futile to formulate a theory without understanding what the theory is to explain--a requirement not always taken seriously in this area. One aspect of the problem is the tremendous speed with which language acquisition takes place. The bulk of syntax is known to four-year-olds. Experimental studies of children show this (Berko, 1958; Slobin, 1966b), as well as ordinary observation. Of course, linguistic advancement continues long after age four, but these late developments involve such matters as changes in style (Labov, 1964) and possibly semantics--but not syntax.

A second aspect of the problem of language acquisition is the emergence of linguistic abstractions. Children develop structures that are completely abstract, ones never made manifest in the actual speech of adults, but nonetheless crucial to syntactic organization.

The claim will be made below that these problems--speed and abstraction--are intimately related, the speed of acquisition being possible because of the way in which children develop abstractions. But in order to present the argument, we must first clarify some preliminary issues. It is to these questions that we now turn.



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A language is some kind of relation between sound and meaning, expression and content, outer and inner form (Sapir, 1921). So describing language is probably the most general true statement one can make about it. Consider paraphrase, for example. One can always find two or more sentences that express the same meaning. Declarative sentences and their passive counterparts are merely the most obvious examples--the junta horribly wrecked the economy and the economy was horribly wrecked by the junta mean essentially the same thing, as does the economy's wreckage by the junta was horrible in one of its senses. In paraphrase, the same content is expressed in different ways. The opposite phenomenon is ambiguity, where different content is expressed in the same way--for example, outgoing tuna, or for some bad examples, see my previous paper.

In the case of ambiguity and paraphrase, expression and content cannot be the same. But, of course, the entire phenomenon of language is precisely that expression and content are never the same. All sentences consist of a manifest part (expression) and an abstract part (content). The arrangement of the one is not in general the same as the other. To suppose otherwise is to commit Colonel Blimp's error--that English (for instance) is so marvelous because it is the only language where the order of words is the same as the order of ideas.

One of the major developments in recent linguistic theory bears on the distinction between expression and content. In the generative grammars developed by Chomsky (1965) and others, the deep and surface structures of sentences are related to each other in a manner described explicitly by the so-called rules of transformation. The deep structure contains all the syntactic information necessary to place the correct meaning on a sentence--such as where the subject or predicate is, or whether the sentence is affirmative or negative, etc. The surface structure, on the other hand, contains all the syntactic information necessary to place the correct pronunciation on a sentence--such as the spoken order of morphemes, the location of constituent boundaries for determining stress, etc. The deep and surface structures of a sentence, although differently arranged, always stand in a specific relation to one another--a relation described by one or more transformations. Thus, a child acquiring a language must become acquainted with the relations it maintains between the deep and surface structures of sentences. That is, he must acquire a transformational grammar.

Having gone this far, we can re-phrase the problem of linguistic abstraction in terms of a transformational grammar. In acquiring the transformations that define their native language, children learn to relate deep and surface structures. But the deep structures of sentences are never displayed in the form of examples, stimuli, responses, or anything else. They are abstract. And, for one who does not already know the language, they are quite inaccessible. It is this simple linguistic fact, which every child faces and overcomes, that eliminates S-R theory as a serious explanation of language acquisition.

There is no form of S-R theory that can account for the emergence of relations, one half of which are never manifested. The most fundamental ground-rule of behavioral analysis--that a phenomenon can be analyzed into responses paired with stimuli--is contradicted. Moreover, there is no conceivable elaboration of S-R theory, short of abandonment, that can apply to the acquisition of linguistic abstractions. Operant analysis, mediated S-R connections of any degree of complexity, S-S and R-R connections, all are inappropriate forms of analysis. It is not so much that S-R theory is generally wrong in the case of language acquisition, as that it is generally irrelevant. The development of language, a crucial part of which is the development of linguistic abstraction, is a mental, not a behavioral, phenomenon (cf., Katz, 1964).

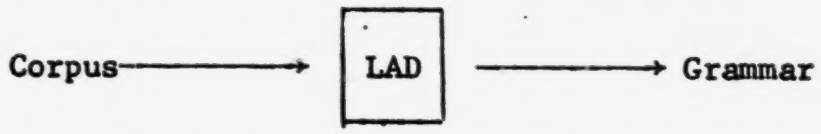
Any account of language acquisition must consider the emergence of linguistic abstractions. Although S-R theories are inappropriate for this purpose, there are numerous other hypotheses that can be advanced. The one to be elaborated here fits into the general framework stated by Lenneberg (1967), and may be regarded as an attempt to develop further the biological point of view toward language that he urges.

Conceiving of language as a biological phenomenon, one naturally regards it as the product of evolutionary specialization--just as every aspect of man's nature is the product of evolutionary specialization. The exact construction of man's skeleton, for example, or the characteristic limitations on his perception, or the specific manner of his communication--all are unique features of the species, the outcome of a unique evolutionary development. Given such a biological point of view, the main problem is to describe the specialization. In the case of man's specialized communication, the problem of description comes to a focus at two points: on the one hand, on language itself; on the other

hand, on the biological support for language. Descriptions of the first kind are given in linguistics. A transformational grammar is taken here to be the best approximation to such a description currently available. Descriptions of the second kind are far less well studied, the problem only recently having been recognized, but the remarks below are to be taken as belonging to this category. What follows, then, is essentially a hypothesis about man's capacity for language, and the way in which this capacity interacts with linguistic experience.

It will be helpful to approach the problem in a semi-formal way. Let us consider, not children for the moment, but an abstract Language Acquisition Device (Chomsky, 1957), which we can call LAD for short. LAD receives a corpus of utterances. Some of these are grammatical sentences in the language to which LAD is exposed, some are not. The corpus is large, but not unlimited in size. We can assume that it contains the number of sentences overhead by a two-year-old child. Upon receiving such a corpus, LAD produces a grammar--that is, a theory of the regularities that hold within the corpus. LAD thereby distinguishes grammatical from ungrammatical structures, and develops an ability to understand and produce an unlimited variety of sentences.

The arrangement just described can be diagramed as follows:




If we understood the internal structure of LAD--the contents of the box above--we would understand how LAD develops a grammar from a corpus. The problem is analogous to the engineering exercise of inferring the structure of a "black box" from various input-output relations. In the case of LAD, the input is a corpus of utterances, the output is a transformational grammar, and its internal structure is what we wish to reconstruct.

One general consideration concerning LAD's internal structure is that it must be arranged so as to acquire any language with equal ease. LAD's structure should not bias it in the direction of some languages and away from others. Which is to say, whatever comprises the internal structure of LAD must be universally applicable--LAD may contain information bearing on the general form of language, but it must contain no information bearing on the form of any particular language.

The description of linguistic universals is the goal of the theory of grammar (Chomsky, 1965; Katz, 1966). As a linguistic enterprise, the theory of grammar states the conditions to be met by the grammars descriptive of individual languages--for example, that each grammar must be transformational. As an account of LAD, the theory of grammar can be offered as a description of LAD's internal structure. Whatever is in LAD is (or will be) mentioned in the theory of grammar. By offering the theory of grammar as a description of LAD in this way, we offer a hypothesis about LAD's internal structure. It is an empirical question whether or not LAD's structure can be so described.

LAD, of course, is a convenient fiction. The purpose of considering it is not to design an actual machine. On the contrary, the purpose is to isolate certain crucial points in the acquisition of language by real children, a purpose served because LAD and children present exactly the same problem. Just as LAD is confronted with a corpus of utterances, some of which are grammatical sentences and some not, so are children. And just as LAD develops a grammar from the corpus on the basis of some kind of internal structure, so do children. Moreover, since children and LAD produce identical grammars from identical corpora, LAD and children must have the same structure, at least within the limits that different children may be said to have the same structure. A hypothesis about LAD is ipso facto a hypothesis about children's linguistic capacities.

The connection between the theory of grammar and children's capacities for language is straightforward. Languages possess universal features because they are all acquired. Each successive generation of children automatically imposes those features on their language that correspond to their native capacities. Thus, these features appear universally, and the theory of grammar is accordingly possible.

What are the universals described in the theory of grammar? Some have to do with phonology. Every language, for example, employs consonant and vowel types, and every language has a sound-system that can be represented by various combinations of some 15 distinctive features (Halle, 1964). Other universals may have to do with semantics--universals that are, essentially, constraints on possible concepts (Katz, 1966).

Within syntax, most universals have to do with the deep structure of sentences (Chomsky, 1965). Thus, every language contains the same basic syntactic

categories, arranged in the same few ways--such categories as sentences, noun phrases, predicate phrases, and so forth. And every language adheres to the same basic grammatical relations among these syntactic categories--such relations as subject and predicate, verb and object, modifier and head.
All these syntactic universals are aspects of the deep structure of sentences, and all consist of syntactic information essential for the establishment of meaning. In addition, every language maintains a distinction between deep and surface structure, yet relates them in specific ways, and so, every language is transformational.

Although the transformations of each language are largely, if not exclusively, idiosyncratic, the <u>types</u> of relation between deep and surface structure are not. It is in the combination of universal types that transformational uniqueness arises (just as it is in the combination of universal distinctive features that a unique phonological system arises). Putting these considerations together--that most syntactic universals exist in the deep structure of sentences, and that most transformations are idiosyncratic combinations of universal types of relation--we obtain an account of how children develop linguistic abstractions.

Linguistic abstractions are those universal categories and relations that reflect children's innate capacities, and they are <u>made</u> abstract through the acquisition of transformations. Thus, a language is acquired through children discovering the relations that hold between the surface structure of its sentences and the universal aspects of its deep structures, the latter being a manifestation of children's own capacities. The interaction between children's capacities and their linguistic environment occurs at just this point, in the acquisition of transformations. Not every aspect of the deep structure can be so explained, however. The order among categories in the deep structure, for example, is variable among languages, and so must (on the present hypothesis) be acquired from evidence in the corpus. Nonetheless, the vast bulk of linguistic abstraction is subsumed under the hypothesis that what a child learns in learning a language are its transformations.

Although the number of different transformation rules in any language is large, the number of universal elementary transformations is a mere handful. A particular transformation may consist of a permutation, an addition, a deletion, or some combination of these. Thus, for any particular transformational

rule, children must discover only three different kinds of relation between deep and surface structure--a tremendous constraint on the number of logically possible arrangements. For example, no surface structure contains the elements of the deep structure in reverse order, or twice their number, or every other one--these being possible, but non-existent, relations. Constriction to three relations is presumably one outcome of the species--specific evolution that underlies natural language.

Given this view of the problem, we can now understand why the speed of language acquisition seems so inexplicable. Evidently children have the ability to learn new, and often complex, combinations of already-known relations, and they do so with tremendous efficiency. But such learning, universal among children and possibly specific to this species, apparently has never been studied by experimental psychologists interested in the processes of learning. There is a gap in the technical knowledge of learning that neatly surrounds whatever children do to acquire transformations. Laboratory studies of learning focus on the acquisition of new relations, not on the acquisition of new combinations of old relations. Moreover, the relations studied are typically not those employed in syntax. They are, instead, intentionally arbitrary connections--prescribed associations between events and reactions to them--toward which there is no reason to suppose that children are predisposed. It is not surprising, therefore, that laboratory studies of children's learning fail to prepare us for the speed of language acquisition. The relevant phenomenon has never been investigated; and until it is, the prospects of understanding the speed of linguistic development are slim indeed.

We can, however, discuss another aspect of language acquisition--the possibility that the universal features of the deep structure are a manifestation of children's capacities. If a language is acquired by discovering the transformational relations that hold between its various surface structures and the universal features of its deep structures, the latter must then be present in children's earliest grammatical speech.[3] Early speech is supposedly free of transformations, and therefore should be a direct manifestation of children's capacities. In effect, early sentences should be the universal parts of the deep structure of sentences, but pronounced directly. Evidence related to these conclusions is contained in Slobin's Chapter 1.

Grammatical categories and hierarchical sentence structures. In order to discuss the appearance of grammatical categories and hierarchical sentence structures in child language, it is necessary first to consider some facts about the so-called basic grammatical relations--the concepts of subject, predicate, main verb, object, modifier, and head. All are abstract relations, defined in the deep structure of sentences, and all are truly relational, not a fixed property of particular grammatical categories. The first characteristic means the basic grammatical relations cannot be learned from a corpus of sentences, whereas the second means they cannot be associated with particular words or categories of words.

The subject of a sentence is a NP immediately dominated by S; the predicate of a sentence is a PredP immediately dominated by S. The subject-predicate relation, therefore, holds between a NP and a PredP when both are dominated by the same S. The main verb of a predicate is a V immediately dominated by a PredP, and an object of a verb is a NP also immediately dominated by a PredP. The verb-object relation is defined accordingly. Finally, a modifier is any determiner (Det) immediately dominated by a NP, a head is any N also immediately dominated by a NP, and the modification relation holds between a Det and a N when both are dominated by the same NP.

These relations are contained in the theory of grammar, being universal constraints on the form assumed by any transformational grammar. Moreover, they apply only to the deep structure of sentences, since numerous surface structures violate them, making consistent definitions impossible at this level. In English, for example, sit down apparently lacks a subject, but this is true only in the surface structure--the deep structure contains a pronominal subject marked for second person (reflecting the fact that imperatives are understood to have second-person reference). Similarly, the two sentences, John is easy to please and John is eager to please have identical surface structures, but differ in the grammatical relation occupied by John--object in the first, subject in the second. The deep structures of these sentences, unlike their surface structures, differ in just the right way for the definitions given above to apply.

The basic grammatical relations are relevant to the hierarchicalization of sentences. When applied together, the six relations impose a correct hierarchical structure on the categories of S, NP, PredP, V, Det, and N. By virtue

of each relation, one category is dominant over another; by honoring all six, a unique hierarchical arrangement results. Only the temporal (left-to-right) order is left unspecified--a correct result, as languages differ among themselves in the order of major constituents (Greenberg, 1963).

Since the basic grammatical relations are defined in the theory of grammar, they supposedly describe an aspect of children's capacity for language. The gist of the claim is that two words, for example, one classified as a noun and the other classified as a determiner, inevitably comprise a NP if they interact meaningfully. Conversely, if one word is understood as modifying another in parental speech, one of them is inevitably classified as a N and the other as Det. Each of the basic grammatical relations imposes a rigid constraint on the organization of words when a child expresses or comprehends meaning. A hierarchical arrangement of sentences automatically results from children having something to say.

Evidence exists that the basic grammatical relations are honored in children's earliest patterned speech, if not before. One of Brown and Bellugi's (1964) Ss, for example, constructed all his early utterances so as to conform to the basic grammatical relations (McNeill, 1966a), even though there was no way for the child to discover the basic grammatical relations in parental speech. Although adults say things like come and pick this up, the surface structure of which violates both the subject and predicate relations, children never do in their early speech. Similar observations have been made of children exposed to Russian (Slobin, 1966a) and Japanese (McNeill, 1966b). Young children apparently manifest similarities to one another, in spite of diverse linguistic experiences, and do so in a part of syntax relevant to the deep structure of sentences. The similarities exist because the basic grammatical relations reflect innate intellectual abilities, which emerge early and are common to all (cf., Bruner, Olver, Greenfield et al. for some discussion of this possibility).

In the argument proposed here, therefore, the hierarchical arrangement of speech is inherent in the ability of children to comprehend and express meaning--comprehension and expression can take no other form. The argument takes into account the fact that semantic interpretation in every language presupposes a hierarchical arrangement of grammatical categories. At the same time, it suggests a basic insight into the unfolding of children's intellectual abilities.

Of somewhat greater obscurity, however, is the way in which the categories related by the basic grammatical relations are themselves elaborated in development. We must consider at least two hypotheses--differentiation and feature-assignment--each of them suggested by different observations of children's early speech. Feature-assignment is the more general hypothesis, and currently seems to be the more plausible. Both hypotheses are consistent with the preceding discussion of the basic grammatical relations, however. They differ only in what is supposed to be the origin of the categories related by the basic grammatical relations--a hierarchy of grammatical categories, or a set of basic syntactic features.

As summarized in the first chapter, all children have at first a simple di- or trichotomization of their vocabulary into grammatical classes. Typically, one or two pivot (P) classes arecombined with an open (O) class, resulting in such sentences as bandage on, blanket on, fix on, etc. The distinction between P and O classes reflects a genuine grammatical invention by a child. Words from the P class rarely, if ever, stand alone in a child's speech, but words from the O class do so often. The constraint on the occurrence of P words indicates that they have been organized in a novel way, since before the P-O distinction is drawn, all words have the privilege of occurring alone--necessarily, since all utterances at this point consist of single words. The interpretation of the grammatical invention, however, is something less than clear.

These are, on the one hand, observations of the following kind. The early sentences of one of Brown and Bellugi's (1964) Ss appeared to be organized around a P class that contained the articles (a, the), two demonstratives (this, that), two possessives (my, your), various adjectives, and the words other and more. These are the adult categories. For the child, the words were all indifferently pivots.

The process of development after this point was differentiation: first the articles were removed and used in unique contexts, then the demonstratives, then the possessives and finally the adjectives, leaving behind a few words in a residual P class. In five months, five grammatical categories had emerged from a single heterogeneous class. In order for development to have followed such a course, the original P class must have been "generically appropriate" (McNeill, 1966a). That is to say, it must have been based on distinctions that proved to be correct when differentiation later took place.

Brown and Bellugi's S, for example, had placed both articles in his P class; he did not have one in the P class and the other in the O class. Similarly, every adjective (about a dozen) then in the child's vocabulary was classified P; none was classified O. Thus, his P class contained every available member of several adult classes, even though these classes were not yet themselves recognized.

It was suggested elsewhere (McNeill, 1966a) that generic classification and the differentiation it supports reflects the existence of a hierarchy of grammatical categories, the more superordinate layers of which are universal, the more subordinate layers of which are the idiosyncratic categories of each language. (Such a hierarchy, of course, is not the same as the hierarchy associated with the basic grammatical relations--despite the unfortunate similarity of terminology.) The existence of a universal hierarchy of categories would explain not only differentiation in the development of grammar, but also the interpretability of children's speech by adults.

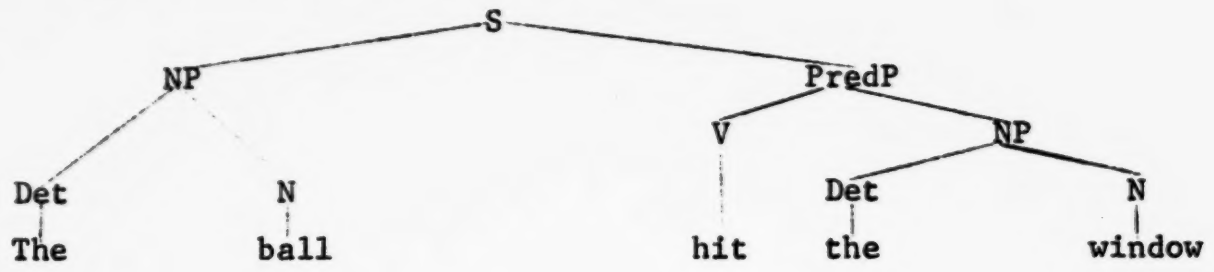
Differentiation, if it actually exists, would be the result of classifying words into ever-more subordinate divisions of the hierarchy of categories. The initial division, for example, might be between modifiers and the words they modify. The outcome would be a P and O class. The next division might be between words that modify count nouns and words that modify all nouns. The outcome would be to remove the indefinite article from the P class. And so forth. Such an account fits Brown and Bellugi's S well enough. However, a basically different view, reflecting a basically different conception of the origin of grammatical categories, can be proposed and may be closer to the truth.

As noted above, differentiation as a process of development presupposes that a child's initial grammatical categories are generically appropriate. The P class, for example, must contain every current example of the adult grammatical classes later to be formed out of it. However, not all children arrange their vocabulary in this way. According to Slobin (1966c), one of Miller and Ervin's (1964) Ss located adjectives in both the P and O classes, which makes differentiation of the adult class of adjectives impossible. In the case of this child, a form of reclassification had to occur instead, since the P-adjectives and the O-adjectives both had to be dislodged in order to develop the adult category. One of McNeill's (1965) Japanese Ss showed the same initial arrangement--having placed adjectives in both her P and O classes. The same phenomenon, inconsistent with differentiation as a mechanism of development, but appearing in the speech of children exposed to utterly different languages, suggests that some basic generalization has been missed, at least.

We would like to have a hypothesis broad enough to cover children who differentiate primitive grammatical classes as well as children who reclassify them. In fact, such a hypothesis can be developed from the remarks already made about the basic grammatical relations.

Let us take into account a fact not recognized before. Whenever a child places a semantic interpretation on a sentence heard in parental speech, it is possible for him to assign syntactic features to the words of the sentence--i.e., to construct dictionary entries for the words, using his understanding of the sentence as a source of information. What features might a child employ? A natural source exists in the categories already organized hierarchically by means of the basic grammatical relations. (We leave open for the moment just what these categories might be.) Note that it is not important to assume that a child makes an assignment of features on every occasion that he understands a sentence in parental speech, nor is it important to assume that he understands every detail of a sentence when he does make a feature assignment. It is only necessary to assume that when a child does understand some part of a sentence, he does so by means of some or all of the categories S, PredP, NP, etc., and the grammatical relations defined among them. This assumption, of course, is fundamental to our entire discussion of child language, so making it again in the present context introduces no special complications. On the contrary, doing so provides further motivation for making the assumption in the first place.

How might an assignment of features take place? Syntactic features indicate either the category to which a word belongs, or the contexts in which the word can appear (Chomsky, 1965). For example, boy is a member of the category N and can appear after a determiner. Its dictionary entry, then, can be written in part as [+N, +Det__], the square brackets indicating a feature matrix and the dash indicating the position occupied by boy. At some point children must begin to compile dictionary entries like this. The present suggestion is that they begin with the basic syntactic categories of the grammar. If a child fully understands the sentence, the ball hit the window, he will necessarily have organized it in terms of the phrase marker.



Each word in the sentence could potentially be classified according to its position within this structure. For example, ball could receive the feature [+N], that being the category to which it is assigned by its role as the subject of the sentence; and it could be given the contextual features [+Det__, +__PredP], these being the environments of ball within the phrase marker. In a different sentence, the man hit the ball, ball could also receive the features [+V__] and [+NP__].

Of the six contextual features made available through elementary phrase markers such as the one just given (NP__, __PredP, Det__, __N, V__, and __NP), a particular child at a particular time may use every feature or any subset of them. The most elementary method would be to start with just one feature and classify all words in terms of it, whenever appropriate. A slightly more complicated method would be to use two or more features, but to classify words disjunctively--assigning no more than one feature to any word. A more complicated method yet would be to use two or more features and to classify words conjunctively--assigning every feature to every word, whenever appropriate. The different methods would correspond to different levels of understanding by a child.

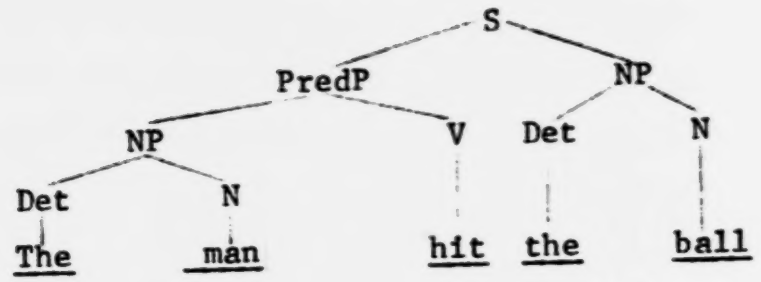
These considerations apply both to the generically appropriate P-class of Brown and Bellugi's S, and to the other children's cross-classification of adjectives. Regarded as the result of feature assignment, Brown and Bellugi's S was using the most elementary method mentioned above--classifying words in terms of just one feature. The feature was [+__N] and it automatically led to a generically appropriate classification of adult categories. Articles, adjectives, possessives, demonstratives, and determiners all take [+__N] in English. This view of Brown and Bellugi's S also accounts for the intuition that his sentences at the earliest stage often involved modification. It is through the modification relation that the feature [+__N] becomes available.

Whenever a child employs just one feature as a basis of classification the outcome will be generically appropriate, but when a child employs two or more features, either disjunctively or conjunctively, the outcome will not be generically appropriate. Suppose, for example, that a child disjunctively classifies words in terms of [+__N] and [+NP__], that is, in terms of modification and predication. Some words can be classified only [+__N]--articles, for

example. Others can be classified only [+NP__]--verbs, for example. Adjectives, however, can be classified both ways: [+__N] in the red ball and [+NP__] in the ball's big. As long as these two features are applied disjunctively, some adjectives will be placed in one category, with the articles, possessives, demonstratives, and determiners, whereas other adjectives will be placed in a second category, with common nouns and verbs. That is, adjectives will be cross-classified. Regarded as the result of feature assignment, Ervin and Miller's and McNeill's Ss were disjunctively classifying in this manner, using the two features [+__N] and [+NP__]. An observation in support of such an analysis comes from the actual composition of the 0-class in both cases. Besides adjectives, the 0-classes of these children contained nouns and verbs, and nothing else. Nouns and verbs, of course, are the other two adult classes that could receive the feature [+NP__] within simple phrase-markers.

Eventually, children come to classify conjunctively. Languages all make it possible. In the case of adjectives, conjunctive classification means assigning both [+__N] and [+NP__] to every word, which would lead to differentiation for Brown and Bellugi's S, to reclassification for Ervin and Miller's and McNeill's Ss. In the end, of course, children require many more features than the six interrelated by the basic grammatical relations, but this aspect of language development has not at all been studied.

Notice that the ultimate basis of a correct assignment of features is the correct comprehension of the meaning of a parental sentence. However, there is no guarantee that a child's comprehension of adult speech will be correct in all cases, especially during the early stages of language acquisition. But whatever meaning a child does place on a parental sentence, his comprehension must be organized in terms of the basic grammatical relations--this is the substance of the claim that these relations are a reflection of innate predispositions. Consequently, any misconstrual of parental meaning will lead to an incorrect reconstruction of the order of categories in the adult language. For example, suppose that a child takes the man hit the ball to mean what in adult English would be rendered as the ball hit the man. An ambiguous extralinguistic situation could lead to this kind of confusion. Given such a misinterpretation, a child must then organize the total sentence as

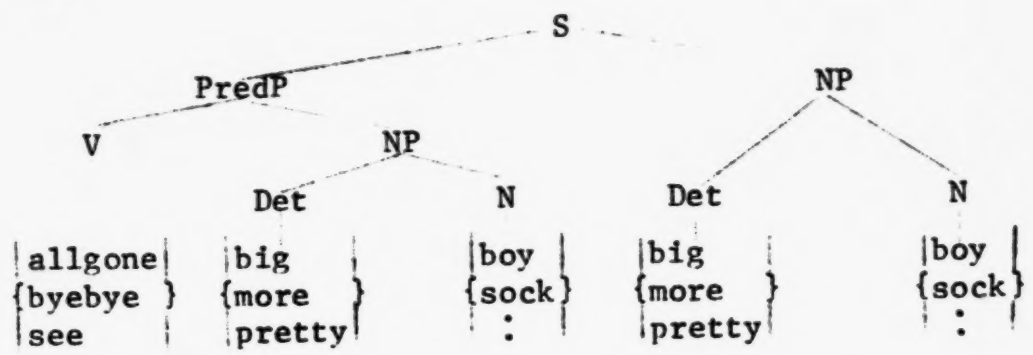



and draw the incorrect conclusion (for English) that predicates precede subjects in sentences. A child who misunderstands parental speech in this way should then utter sentences backwards for a time. Something of the kind appears to have happened to Braine's (1963) S described in the first Chapter (cf., Table 1).

The P class for Braine's S contained adjectives (big, more, pretty) and a possessive pronoun (my). In these respects, his P class was the same as the P class of Brown and Bellugi's S, and the words presumably were marked [+__N]. However, the P class of Braine's S also contained allgone, byebye, see, night-night, and hi. We cannot tell from Braine's account if these words served as modifiers when combined with words from the 0 class, and so were also marked [+__N], but that function seems quite unlikely for them. A more plausible role, at least for allgone and byebye is that of Predicate. Allgone boy would then correspond to the adult sentence, the boy is allgone, and bye-bye Columbus to Columbus is going byebye. The two P words would be marked [+__NP], but the grammatical relation served is predication. That is, predicates, in these cases, go before subjects, and the phrase marker is arranged in reverse order with respect to English, like the prhase marker given above. See and night-night, two other unaccounted words in the P class of this child, are less clear as to their significance. Expressions like see car and see sock seem to be verb-object pairs, whereas see boy might be either verb-object or predicate-subject. Thus, although see is also marked [+__NP], at least some of its uses are in relation to objects of verbs, not subjects of sentences. Night-night may be like allgone, as in night-night mommy, meaning that mother is going to bed. However, night-night may also be like hi, that is, not a verb at all, but some kind of a salute.

Looking only at the reasonably clear cases of allgone, byebye, and see, we find that two different grammatical relations result in identical featural markings--all are [+__NP], but the first two are related to subjects and the third is related to objects, at least some of the time. Pivot-open sentences present an ambiguity in grammatical function. Although we do not know what phrase marker

was actually available to Braine's child at the earliest stage, the most elaborate possibility is:




This analysis, of course, merely shows how the P-class of Braine's S can be interpreted on the lines established above. It has no independent justification. To support the interpretation, we require information on the child's intended meaning for such expressions as allgone daddy, see daddy, and see sock, information that is difficult to obtain in general and not available at all in this case.

However, note that in regarding allgone, byebye, and see as marked [+__NP], but as playing different grammatical roles, we at least make an intelligible claim about the child's linguistic abilities. The opposite interpretation--that the child's sentences are derived directly from adult models--ascribes thoroughly mysterious powers to the child. It asserts, in effect, that his accomplishments are inherently beyond explanation. A sentence such as allgone sock, for example, has no direct model in adult speech. Any account of it must therefore explain the fact that a novelty has occurred. On the analysis given above, the novelty is a misconstrual of the order of constituents in English, and it arises from the inevitability of expressing meaning, even mistaken meaning, in terms of the basic grammatical relations.

The alternative analysis assumes that the child constructed allgone sock from superficially homologous examples found in parental speech--presumably from such specimens as remove the sock or burst the balloon. But this assumption presents a dilemma. Although it may seem straightforward to say that a child obtains grammatical forms from adult examples, we must then claim that sentences such as allgone sock have completely exotic meanings. Exotic meanings are totally and chronically beyond our grasp, and ascribing to children the ability to create them is to abandon hope for explaining linguistic development altogether. For we have merely said that children have the ability to be inexplicable.

We have considered two distinct hypotheses about the origin and development of children's grammatical classes. One hypothesis is that they arise from a universal hierarchy of grammatical categories, and the other, that they arise from an initial assignment of syntactic features derived from the basic grammatical relations. On the evidence currently available, the second hypothesis is the better supported. It accounts for differentiation and reclassification as the two forms of development so far observed, and it makes quite specific claims about interconnection between semantic interpretation and children's early grammatical forms. It is thus advantageous on the double grounds of comprehensiveness and specificity. In addition, it corresponds more closely to the analysis that has been adopted for adult grammatical competence (Chomsky, 1965), and so accounts for the beginnings of the adult system in a natural way.

Apart from the relative merits of these two hypotheses, however, there is a general observation that supports either of them against any weaker hypothesis. The observation is that children's speech is at first semi-grammatical in the technical sense of a generative grammar (Chomsky, 1964), and that development consists of a reduction of such semi-grammaticality. The observation is based on the fact that adults can judge which of two telegraphic sentences was earlier in development solely on the grounds of relative grammaticality, just as adults can tell that golf played aggressive is less grammatical than golf played John (McNeill, 1966a). Under the differentiation hypothesis, a child's development of grammatical classes and an adult's judgments of grammaticality both consist of relating sentences to different levels in the hierarchy of categories. The two kinds of performance come together because they rely on the same hierarchy. Under the feature-assignment hypothesis, on the other hand, adult's judgments of grammaticality and children's development of grammatical classes both consist of relating sentences to an ever richer stock of syntactic features. The two kinds of performance come together because they share the same fundamental features.

The previous sections have all had to do with one part or another of the deep structure of sentences. We turn next to transformational structure, and to the miniscule knowledge we have of its development.

The emergence of transformations. It is in this aspect of the acquisition of language that children being their intrinsic grammar into accord with the grammar of their native language. It is here, accordingly, that the interaction

between a child's innate linguistic capacities and the corpus of speech he receives from his parents takes place. Moreover, it is through the acquisition of transformations that children come to produce linguistic abstractions.

There are several reasons, therefore, why the acquisition of transformations comprises one of the more interesting aspects of the study of linguistic development. Unfortunately, however, it is also one of the less well understood. No one really knows how a child formulates transformations, or why he does it, or even when he does it.

In terms of the argument advanced previously, the acquisition of a transformation marks the discovery, in the case of each particular sentence type, of the relation between deep and surface structure. Since the types of possible relations are extremely limited in number, the simplest course of development would be for a child to acquire transformations in a step-wise manner--first noticing one elementary relation, then another, then a third, and so on, until the entire transformation has been reconstructed. However, more complex lines of development are also possible, and, indeed, may be the rule. The development of negation is instructive at this point--a matter taken up below.

First, however, we shall discuss morphological regularizations. Consider a child who says foots instead of feet, or digged instead of dug. He makes two rather straight-forward contributions to psychological theory. One is that the practice and imitation of surface forms is irrelevant to the acquisition of transformations, at least in these cases. The other is that transformations themselves require no practice in order to become a part of grammatical competence. Let us consider the imitation of surface forms first.

Imitation could play a role in language acquisition by introducing novel forms into a child's grammar. For example, a child who does not yet inflect verbs for the progressive aspect might come to use -ing by imitating such sentences as your nose is dripping, Adam. Once -ing has been imitated, a child would have a chance to notice the relation between surface forms with -ing and the base forms to which they are related, perhaps through trial and error--trying -ing first with one deep structure and then another and checking to see which pairings are well received. The objection to this account is simple. Rather than absorb novel forms by imitating them, children reduce imitated forms to the current level of complication of their grammars (Ervin, 1964). A child not yet producing

the progressive aspect, for example, would imitate the relevant part of your nose is dripping, Adam as nose drip, not as nose dripping. There are some circumstances when imitation is grammatically progressive, but these are special cases and do not reflect a general didactic role for imitation. One is the imitation of sentences that are short relative to a child's memory span, an effect discussed in McNeill (1966a) and Slobin (1964). The other is the imitation of expansions, an effect discussed below (p. 27).

Overt practice with surface forms appears to be not only irrelevant to the acquisition of transformations, but transformations themselves apparently require little or nothing in the way of overt practice. The evidence for these remarks is summarized in Chapter 1. In the case of both the past-tense inflection of verbs and the plural inflection of nouns, children initially produce the correct strong forms (dug, feet), then adopt the weak forms (laughed, beets), losing at the same time the strong forms (digged, feets, or foots, instead of dug, feet). The strong forms, being frequent in adult speech, could be acquired at first as independent vocabulary. However acquired, they also become frequent in the speech of children, and so receive a good deal of overt practice. The fact, therefore, that the correct strong forms disappear when the weak forms emerge shows clearly that a child's experience with surface forms has little or no effect on his acquisition of transformations. The experience of saying dug, for example, must contribute nothing to the relation between dug and the base form (Past), if dug disappears as digged appears. The same is true of the inflection of nouns.

The converse fact, that the weak inflections appear everywhere after little or no overt practice, is evidence that a child does not require many (if any) pairings of abstract base and overt surface forms in order to reconstruct a transformation. Instead, the establishment of the connection may be entirely covert, a conclusion drawn by Ervin (1964). Surface forms appear in a child's speech only when already related to base forms--i.e., only when already capable of receiving a semantic interpretation via the deep structure. (This conclusion, of course, was drawn before in connection with the basic grammatical relations.)

We turn next to the acquisition of negation in English. The events here are complex and rich--unexpectedly so, given the superficial simplicity of negative sentences in English. However, if one takes into account the underlying structure of negation (Klima, 1964), paying some heed to the variety of information

incorporated therein, the complexity of development can be seen to correspond closely to the complexity of what is developed.

Slobin, in Chapter 1, following Bellugi (1964), traces the development of negation through four stages. The four stages reveal different phenomena, and will be discussed somewhat out of chronological order: Stage 1 first, then Stage 4, and finally Stages 2 and 3.

The negative sentences of Stage 1 are extremely simple, all being based on the schema NEG + S or its inversion, S + NEG. Examples are no singing song, no sit there, no David fun play, and wear mitten no. In every case, a negative element is affixed to an otherwise affirmative sentence, the internal "structure" of which is left undisturbed. As Slobin notes, these sentences are remote from the available adult models, so we cannot expect to account for them as a simple derivation from adult speech. Instead, a different principle seems to be operating.

The deep structure of a negative sentence in English is built on the schema NEG NP PredP (Klima, 1964), in which NEG is located beyond the boundaries of the rest of the sentence. One hypothesis about this location of NEG is that it reflects an aspect of children's capacities for language--an ability to deny a proposition by attaching a "minus sign" to the proposition being denied. On this hypothesis, the location of NEG describes an aspect of the linguistic predispositions of children, and should therefore be duplicated in the linguistic descriptions of other languages. It does appear also in Japanese (Kuroda, 1965) and Russian (Slobin, 1966a), so there is no evidence, at least, that contradicts the supposition that sentence-external NEG is universal.

Assuming that sentence-external NEG is indeed a manifestation of children's capacities, then all children must learn to relate this schema to the surface structure of negative sentences in their native language. But until the relations are acquired, children's negation must be directly patterned on the basic schema. Hence, the negative sentences of Stage 1: Stage 1 occurs before any of the transformations involved in English negation have been acquired, and so its sentences necessarily have the form NEG + S or S + NEG. Moreover, negation of this kind persists, despite changes elsewhere,until a child acquires an order-changing transformation for negation, in Stage 3, at which time sentences like no drop mitten disappear, the schema S + NEG now having become abstract.

Early negation in the speech of Japanese children also takes the form of S + NEG (McNeill & McNeill, 1966); so does early negation in the speech of

Russian children, as Slobin notes. We have recently begun observing the speech of a little boy acquiring French, and his negative sentences also have the same schematic form, except for Gallic nasalization--non + S. The syntactic universal of sentence-external negation also appears as a universal of child language, invariably occurring in the earliest phases of linguistic development.

Japanese children are particularly interesting with regard to the universal schema for negation. Japanese interposes no order-changing transformations between the deep and surface structure of negative sentences (Kuroda, 1965). The order of elements in the surface structure of a negative Japanese sentence is like the order of elements in the deep structure, NP VP NEG. If sentence-external NEG is a manifestation of a basic capacity for denial, Japanese children should literally be unable to make errors in negation. Such appears to be the case. Neither of the two children described by McNeill and McNeill (1966) has ever been observed to utter a syntactically deviant negative sentence.

The earliest form of negation, therefore, directly manifests children's linguistic capacities. Negative sentences in the first stage all involve sentence-external NEG, and children all do essentially the same thing, regardless of the language to which they are exposed.

Eventually children come to relate NEG + S or S + NEG to the surface forms used for negation in their language. For the moment, we shall pass over the initial phases of this development, which occurred in Stages 2 and 3, in Bellugi's study, and consider instead the double negatives of Stage 4.

In Stage 4, we find sentences like he can't have nothing, I can't go nowhere, and I never had no turn. We even find I can't do nothing with no string. All the double negatives result from the use of negative indeterminate pronouns--forms based on no. In Stage 3, on the other hand, the equivalent negative sentences all employed affirmative indeterminate pronouns--forms based on some. Thus, we find you don't want some supper, I didn't see something, and you don't want some bottles. Beyond Stage 4 are sentences that use negative indefinite pronouns--forms based on any. These sentences, when they finally appear, will be well formed, at least with respect to the use of pronominals: he can't have anything, I can't go anywhere, and I never had any turn. Putting these observations together, we can say that the order of appearance of pronouns in the development of negation is: some → no → any, that is, indeterminant-affirmative → indeterminant-negative → indefinite-negative.

It should be noted that the order of emergence of these pronouns is not the order of their derivation in the grammar of English. In the latter case, the order is: some → any → no, that is, indeterminate-affirmative → indefinite-negative → indeterminate-negative. Forms based on some are introduced into the deep structure as members of a category that Klima (1964) calls Quantity. Under certain circumstances, a transformation relates this category to surface structures containing any, and under other circumstances, a second transformation relates the deep structures underlying any-type sentences to surface structures containing no. The adult arrangement of transformational rules evidently is a late achievement. Initially children must conceive of things differently. However, as we will see, the differences between the child system and the adult system arise in a completely natural way.

An adult would be inclined to correct the negative sentences of Stage 3 with other sentences containing an appropriate any-form--you don't want any for I don't want some. The extent to which adults supply corrections in this manner will be taken up below, but regardless of the frequency of such corrections, all would include any-forms; none would include the no-forms that actually appear in Stage 4. But this observation is puzzling. A substitution of any for some is not only exemplified in parental speech, but would also derive from surface structures minimally different from the negative sentences of Stage 3. Evidently, children are not guided by a principle of minimal change in the surface structure, for they adopt a form that is doubly removed in adult speech from the negative sentences of Stage 3. In fact, the displacement of some-forms by no-forms introduces a minimal disruption of the deep structure of children's negative sentences. Let us see why this is so.

The words any, anyone, anywhere, and anymore are indefinite-negative pronouns. They therefore differ in two ways from the words some, someone, somewhere, and some more, which are indeterminate-affirmative pronouns. If a child were to adopt the parental corrections of his negative sentences in Stage 3, a double change would have to occur in the deep structure--from indeterminate to indefinite, and from affirmative to negative. Of course, a child might make two simultaneous changes in his grammar, and so adopt the any-forms. However, if a child were to limit himself to the smallest possible change in the deep structure, his only choice would be to change the feature that conflicts with the negative

marking on the rest of the sentence. He must change the affirmative feature to negative. The result is an indeterminate-negative pronoun--one of the words, none, no one, nowhere, and no more, and sentences like I can't go nowhere automatically result. A child could not change the indeterminate feature of the some-pronouns to indefinite, and still retain the affirmative feature, for the simple reason that there are no indefinite-affirmative pronouns in English. Thus, children necessarily use no-forms before they use any-forms whenever they make small changes. Later, presumably, the indeterminate feature is changed to indefinite, while the negative feature is retained, and any-forms result.

We have in this analysis the somewhat paradoxical result that by correcting sentences containing some-forms with sentences containing any-forms, the smallest possible change that parents induce consists of sentences containing no-forms. This result of adult tuition is an excellent example of children's creativity in learning language. A child's problem is to enrich his grammar, and it was done in this case by creatively combining information from two quite distinct sources. Adult sentences with any-forms signaled the place where enrichment was necessary, but adult sentences with no-forms supplied the remedy. There is nothing in the surface structure of English sentences to indicate the merits of this particular solution, but there is a good deal in the deep structure to recommend it. It is a result of a child's effort to systematize the speech to which he is exposed, while at the same time making changes in the deep structure on as modest a scale as possible. A child attempts, in other words, the simplest possible grammatical solution, even at the expense of deviating from adult surface structures.

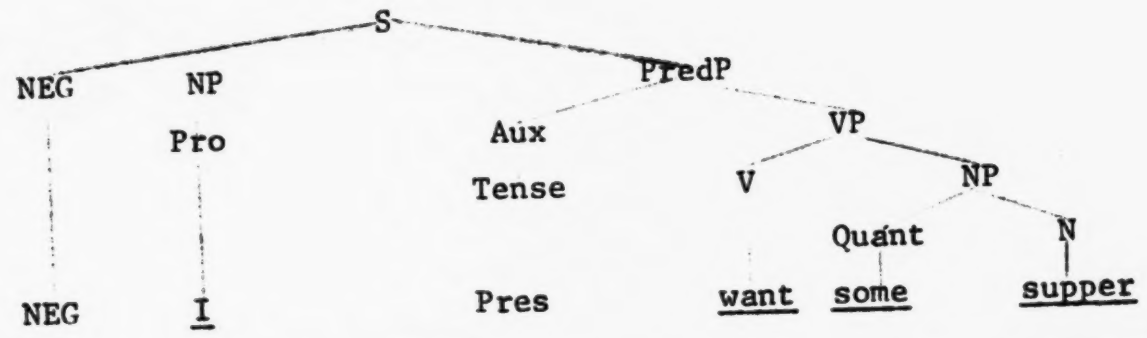
Children have been pictured as changing their grammars as if this were a self-evident process, not itself in need of explanation. Thus, we have taken it for granted that a child would strive to reduce the gap between I don't want some and I don't want any when confronted with the fact that they are different. But it is far from obvious why a child should do this. The necessities of communication, for example, do not require it. The negative sentences of Stage 3 convey the concept of denial quite as well as the negative sentences of Stage 4. Indeed, the primitive negative sentences of Stage 1 convey negation as well as the sentences of any later stage, as, indeed, they should, being underlying forms. Nor can a child's desire to obtain social recognition by pleasing his parents (in some sense of this vague idea) account for linguistic change, not at least in the case of the negative pronouns. A child adopts a form other than the one

his parents use for correction, and we must naturally wonder how he knows that I don't want none will be pleasing to them. We must ask, therefore, what makes a child alter and apparently complicate his grammar so as to include and then elaborate transformations? The events of Stages 2 and 3 suggest a partial answer, though not by any means a full one, and it is to these events that we now turn (for further discussion, see McNeill, 1966a).

In Stage 1, there were two forms of negation--one for assertion, and one for questions. Neither involved a transformation. In Stage 2, there was a considerable development of negative forms--six different varieties in all. Again, with the exception of imperatives, none of these uses of negation appeared to involve transformations, but seemed instead to be organized on phrase-structure principles. As such, Stage 2 presents six different categories of negation, one for each of the five situations in which negative forms appear. It is a cumbersome, sloppy arrangement, the equivalent to having six ways of saying "no," all as different from one another as nouns are from adverbs or articles. It is this very cumbersomeness, however, that may have led to the developments of Stage 3.

Two further varieties of negation appear in Stage 3. If the system were still categorical as in Stage 2, these changes could only be regarded as a step in the direction of further complication. But among the developments of Stage 3 is a complete disappearance of sentences built on the schema NEG + S or S + NEG. Such sentences in Stage 1 were interpreted as direct manifestations of the universal form of negation. Their disappearance in Stage 3 suggests that the schema NEG + S has become abstract, now being transformed to yield such surface structures as I don't want some. There is independent evidence that precisely this development has taken place. Beginning in Stage 2, some sentences contained don't or can't as negative markers. However, don't and can't did not reflect the existence of transformations in Stage 2, since the corresponding affirmative auxiliaries (do and can) were nowhere in view. In Stage 3, on the other hand, sentences like I can have some occur for the first time, providing evidence for one of the major transformations involved in negation. (The other transformation--NEG-displacement--can be only gratuitously inferred.)

According to Bellugi (1965), a child's grammar in Stage 3 assigns the following deep structure to negative sentences (using I don't want some supper as an example):




The same phrase marker would serve for the negative sentences of Stage 1 simply by deleting the Pro-form, the auxiliary, and Quant--three categories absent from Stage 1. Not want supper would result.

By Stage 3, however, a child has discovered the relation between the phrase marker above and such surface forms as I don't want some supper. Two transformations are involved in the relation. One is negative-repositioning, which carries the deep structure.

NEG - I - Pres - want - some - supper

into

I - Pres - NEG - want - some supper.

The second transformation introduces the auxiliary do whenever other forms of the auxiliary (will, have, etc.) are not already present, yielding

I - do+Pres - NEG - want - some - supper,

which is the surface structure of I don't want some supper. Phonological rules then relate (do+Pres - NEG) to don't.

One explanation of the appearance of these transformations in Stage 3 is that they result from the overabundance of special cases in Stage 2, for the two transformations greatly simplified the grammar. If a child did not note the relation between base and surface structure described by the two transformations of Stage 3, there would be seven different and unrelated categories of negation in his grammar. With these relations, however, there is just one category of negation, associated in several different ways to different surface structures.

We may take the activities of a grammarian as a metaphor for what a child does in acquiring a language, for the two--child and grammarian--have goals that are in part equivalent. Both want to reconstruct the competence of the speakers of some language--the grammarian, in order to describe competence; the child, in order to acquire it. And just as a grammarian uses the criterion of

over-all simplicity to justify the introduction of particular transformational rules, so a child may be guided by considerations of simplicity to devise the same rules. In both cases, transformations achieve economy.

This speculation may be extended to encompass systems other than negation. Indeed, it may be extended to encompass the whole phenomenon of linguistic development (cf., McNeill, 1966a). However, all such extensions and the speculation itself suffer the fault of remaining at a high level of abstraction, and for a reason that is important to mention.

The crucial part of the account of transformational development just given is the assumption that transformations advance simplicity. There is little question that transformations have this effect (Chomsky, 1965; Katz, 1966; Halle, 1964). The open question has instead to do with the technical sense in which simplicity is to be described. It is the lack of such a description that leaves the present account in a cloud of abstraction. Nonetheless, the problem is at least tractable, if not yet solved. Ideally, a grammarian's choices among rival grammatical formulations are so made that the resulting grammar describes exactly what native speakers know of the language--i.e., describes the outcome of language acquisition. Thus, a grammarian's method of choosing the simpler grammar must be the same as a child's method, if the grammarian's description is to be correct. The construction of an appropriate simplicity metric, as it is called, will therefore be the decisive factor in making the speculation suggested above precise. It goes without saying that the description of a simplicity metric is a matter in the description of a child's innate linguistic abilities. The correct conception of simplicity is the one yielding a correct description of any language.

The conditions of transformational development. It is generally recognized that language develops through the social interaction of children and adults. However, this statement is unfortunately vacuous--matched only by such other homilies as "language is a symbolic system"--so it is to be welcomed that an effort has recently begun to study the social exchanges between children and adults that support linguistic development. The work has been carried on entirely by Brown (1964, 1966) and his colleagues (Cazden, 1965; Slobin, 1964).

The problem of language acquisition, as it has been construed in this chapter, places a general constraint on the kinds of social interaction that contribute to the acquisition of transformations. The problem for a child is to relate deep and

surface structures in the few ways described in linguistic theory. Since deep structures are abstract, the appropriate relation can be discovered only when an adult provides the surface structure that goes with the deep structure a child has in mind. In view of Ervin's (1964) findings on imitation and practice, showing that surface structures actually occur in child speech only when already related to deep structures, this condition of contiguity seems to be absolute. It thus sets a boundary around the types of social interaction that children actually use to discover transformations. Only those exchanges that have the following general form will suffice:

Exchanges that do not take this form--changes of subject, misunderstandings, and monologues--are all irrelevant under the condition as diagramed, and will either have no effect on a child or will misdirect his attempt to formulate transformations. Numerous other exchanges, however, fit the condition more or less well; some of these have been under study by Brown and his colleagues.

Take expansions, for example. An expansion is the repetition and improvement of a child's sentence by an adult. Thus, for instance, I don't want some might be expanded to I don't want any; or Adam cry might be expanded to Adam cried. In all such cases, an adult attempts to retain the meaning of a child's utterance while recasting it in fully grammatical form. In principle, there are always several well-formed sentences available to an adult as an expansion: I don't want some could lead either to I don't want any or I want some; and Adam cry could lead to Adam cried, Adam is crying, Adam will cry, Adam's crying...etc. An adult, expanding a child's telegraphic sentence, must therefore select one well-formed sentence from a set of possibilities. The one chosen is typically the sentence judged to fit best the extra-linguistic situation. If a child had been crying, but no longer was, Adam cry would be expanded to Adam cried. The child would be given an example of an English sentence marked in the surface structure for past tense. If Adam cried was indeed the appropriate expansion--if the extra-linguistic situation correctly expressed the child's meaning--then the general cordition mentioned above would be met. The child would have in mind the information

represented as (Past) in the deep structure of a sentence and the expansion would provide a surface structure to which (Past) is related in English. Thus, insofar as expansions are appropriate, they provide an opportunity for children to discover relations between deep and surface structures.

One indication that expansions lead children to formulate transformations is that the imitation of expansions, unlike the imitation of other adult speech, is often grammatically progressive (Slobin, 1964). Since imitations are absorbed into a child's grammar of the moment (Ervin, 1964), the progressive imitation of expansions indicates an enlargement of a child's grammar through expansion. In apparent contradiction to this conclusion, however, is an experiment by Cazden (1965). She attempted to influence the rate of grammatical development either by systematically expanding everything children said, or by following everything said by an expatiation--a comment. Compared to children who were treated in neither of these ways, both expansions and expatiations accelerated grammatical development, but expatiations had considerably more impact than expansions. It seems that expansions offer at best a modest influence on development, and possibly offer none at all beyond mere social encouragement. Such a conclusion, however, is unwarranted. For, paradoxically, Cazden's result is to be expected even on the strongest possible assumption that expansions are decisive in the acquisition of transformations. The spontaneous rate of parental expansion is about 30% (Brown, 1964). At least one reason why this figure is not higher is that children utter some telegraphic sentences in situations that fail to make the intended meaning clear. Under such circumstances, adults do not expand. But expansions were provided after every telegraphic sentence in Cazden's experiment. Some of them must have been given without guidance from the extra-linguistic situation (a fact about which Cazden's adult experimenters complained), and some of these must have resulted in incorrect pairings of deep and surface structures--as, for example, the expansion of Adam cry to Adam cried when Adam was about to cry. Thus, even on the excessively strong assumption that expansions invariably lead to the formulation of a transformational relation, the expansion-condition of Cazden's experiment would be expected to result in a small amount of transformational development--the actual amount depending on the relative number of clear and unclear extra-linguistic situations.

A second kind of social exchange involves what Brown has called "prompting" (Brown, 1966). A prompt is an "exchange" in the sense that two people are present--a child and an adult. However, only the adult talks in a "prompt"; the child's contribution, curiously, is not to comprehend. A "prompt" begins when an adult asks a WH-question: what did you do with the goldfish? It continues when the child fails to respond, at which time the adult rephrases the question to take on a more elementary form: you did what with the goldfish? The second version of the question is simpler by one transformation than the first. If a child understands the rephrased version, he then has in mind its underlying structure and has just before heard a surface structure (what did you do...?) to which it is related. Brown found that children usually answer the rephrased question, indicating that they understand it, so the possibility exists that they can formulate the transformation distinguishing the two types of WH-question through "prompt" exchanges. The only indication that prompting has an actual effect on the development of transformations is that children whose parents prompt more often, ask more questions of the type, what did you do..., although these same children rarely (if ever) ask questions of the type actually given to them in the exchange--you did what...? They learn the appropriate transformation, therefore, not the specific form used in parental speech. For a recent description of the emergence of questions in English, see Klima and Bellugi (1966).

A third exchange described by Brown (1966) is interesting in the present context, because it does not meet the general condition described above. The exchange has been dubbed "echoing," and takes the following form: a child says something in part indecipherable--I ate the gowish; an echoing parent then repeats the clear part and replaces the obscure part with a WH-word--you ate the what? Unlike prompting and expansion, this exchange cannot lead a child to discover any of the transformations involved in WH-questions, for the wrong sentence-types are paired. Rather than placing a question and its underlying form together, "echoing" places a question and its answer together--one answer to you ate the what? is I ate the gowish.

We can summarize the argument of this chapter by setting down two of the questions it raises for psychological theory. Linguistic competence, in the form of a transformational grammar, arises from an interaction between children's native capacities and their linguistic experience--the interaction taking the

form of relating the universal aspects of the deep structure to the idiosyncratic aspects of the surface structure of sentences. One question concerns the possibility that some of the linguistic universals so related exist because they are, in fact, universals of human cognition.

It is useful to distinguish two hypothetical classes of linguistic universals. One consists of linguistic features that are universal because of the specialized peculiarities of the human communication system. Logically, such universals could take some other form, but they happen not to. The second category consists of features of language that could not possibly take any other form, because they result, not from specialized peculiarities of the human communication system, but from the special characteristics of human cognition.

Either category, so far as our current degree of understanding informs us, could be totally empty. Conceivably, all linguistic universals are the result of the specialized peculiarities of man's system of communication. Or, equally conceivably, all linguistic universals are the result of man's characteristic intelligence. However, it is unlikely that either of these extreme possibilities is true. Instead, there are probably universals of both types--some that are purely linguistic and others that are not linguistic at all. It should be of more than passing interest to psychologists concerned with intellectual development to investigate the distinction. For it is far from obvious that any linguistic universal not known to exist is either purely linguistic, or understandable on any known theory of cognition, The basic grammatical relations, for example, if they are universals of the second type, exist because it is not possible to organize concepts in other ways, but it is not clear how to explain the basic grammatical relations as the outcome of anything children are currently attested to be able to do.

In learning the transformations of their local language, children form new and usually complex combinations of a small number of possible relations. The relations so combined are themselves universal, although it is impossible to say of which of the two types distinguished above. The method of combination, however, is even more mysterious: indeed, it is impossible to fathom how children learn transformations. Given the speed of language acquisition, it is evident that every child is capable of such learning with great efficiency and spontaneity. But nothing else is known about it. One measure of our ignorance is that only the

most general and trivial condition for the process can be stated: the deep and surface structures of sentences must both be present before a child in order for him to discover how they are related. One is pressed to say which is more remarkable--that (in all probability) a biologically specialized form of learning has been traditionally overlooked in laboratory studies of learning, or that the capacity for language is so highly specialized that an entire research tradition, even though working on other problems, could actually have missed investigating it.

Footnotes

[1]This article will appear as a chapter in D. I. Slobin (Ed.), *Grammatical development in children*, in press.

[2]The research reported herein was supported in part by the Language Development Section, U. S. Office of Education, Contract OEC-3-6-061784-0508. It is also one of several research reports which have been submitted to the Office of Education as *Studies in language and language behavior*, Progress Report V, September 1, 1967.

[3]Except, of course, for the possibility that some aspects of children's capacities may mature later than others. Thus, we expect to find that the non-transformational features of children's early syntax are all described in the theory of grammar, but not that everything in the theory of grammar is present in children's early syntax.

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